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Water mass pathways, transports, and biochemical properties over the South Scotia Ridge west of 50°W

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The ESASSI cruise carried out in the South Scotia Ridge region on January 2008 was a major milestone of the Spanish contribution to the Synoptic Antarctic Shelf-Slope Interaction study (SASSI), one of the core projects of the International Polar Year. One of the objectives of the project was to determine the export of renovated intermediate and deep waters from the Weddell Sea into the Scotia Sea across the gaps located to the west of the Orkney Islands. In that region the Weddell Gyre waters are shallower, colder and fresher than the waters that reach the eastern gaps after surrounding the Orkney Plateau (Gordon et al., 2001). In order to quantify the outflow, an inverse model has been applied to temperature and salinity profiles and initialized with ship ADCP velocities; the domain is the region enclosed between Elephant Island and 50°W, and delimited north and south by the Scotia and Weddell Seas, respectively. Full depth net transports of 7 ± 5 Sv and heat and salt anomaly transports of 14 ± 5 TW and $(0.8 \pm 0.4) \times 10^6$ kg s⁻¹ have been obtained overflowing the South Scotia Ridge west of the Orkney Islands. Waters from the Powell Basin flow northwards through the southwestern gap (51°W, 61.2°S) and westwards across the 50°W transect south of 60.6°S. The clockwise circulation in the Hespérides Trough results in an isopycnal exchanging of properties between the involved water masses and in some diapycnal mixing into the bottom waters. Approximately one third of the volume transport along the northern wall of the trough remains inside the trough; the rest escapes to the South Scotia Sea, mainly across the closest and deepest gap west of the Orkney Plateau. The vertical distribution and associated transports of some biochemical parameters are also presented.